CLAIM SET AS AMENDED

1. (currently amended) A color conversion device for performing pixel-by-pixel color conversion from a first set of three color data representing red, green and blue, or cyan, magenta and yellow, into a second set of three color data representing red, green and blue, or cyan, magenta, and yellow, said device comprising:

first calculation means for calculating a minimum value α and a maximum value ß of said first set of three color data for each pixel;

hue data calculating means for calculating hue data r, g, b, y, m and c based on said first set of three color data, and said minimum and maximum values α and ß outputted from said first calculation ~~calculating~~ means;

means for generating first comparison-result data based on the hue data outputted from said hue data calculating means;

means for generating second comparison-result data based on said first comparison-result data;

second calculation means for performing calculation using the hue data outputted from said hue data calculating means to produce calculation result data;

coefficient storage means for storing matrix coefficients for the hue data, the calculation result data, the first comparison-result data and the second comparison-result data;

coefficient setting means for setting specified coefficients in said coefficient storage means; and

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third calculation means responsive to said hue data, said first comparison-result data, said second comparison-result data, said calculation result data, and the coefficients from said coefficient storage means for calculating said second set of three color data representing red, green and blue, or cyan, magenta, and yellow,

said third calculation means performing calculation including matrix calculation performed at least on said hue data, said first comparison-result data, said second comparison-result data, said calculation result data, and the coefficients from said coefficient storage means.

2. (original) The color conversion device according to claim 1, wherein said third calculation means performs said matrix calculation on said hue data, said first comparison-result data, said second comparison-result data, said calculation result data, and the coefficients from said coefficient storage means, and further includes synthesizing means for adding said minimum value α from said first calculation means to the results of said matrix calculation.

3. (currently amended) The color conversion device according to claim 2, wherein

said coefficient storage means outputs predetermined matrix coefficients Eij (i = 1 to 3, j = 1 to 3), and Fij (i = 1 to 3, j = 1 to 18), and

said third calculation means performs the calculation using the hue data, said ~~said~~ first comparison-result data, said second comparison-result data, said calculation result data, said minimum value α from said ~~calculating~~ <u>first calculation</u> means, and said matrix coefficients to determine said second set of three color data representing red, green and blue, denoted by Ro, Go and Bo, in accordance with the following formula (1):

$$
\begin{bmatrix} Ro \\ Go \\ Bo \end{bmatrix} = (Eij) \begin{bmatrix} r \\ g \\ b \end{bmatrix} + (Fij) \begin{bmatrix} c*m \\ m*y \\ y*c \\ r*g \\ g*b \\ b*r \\ h1r \\ h1g \\ h1b \\ h1c \\ h1m \\ h1y \\ h2ry \\ h2rm \\ h2gy \\ h2gc \\ h2bm \\ h2bc \end{bmatrix} + \begin{bmatrix} \alpha \\ \alpha \\ \alpha \end{bmatrix} \qquad ...(1)
$$

wherein h1r, h1g, h1b, h1c, h1m and h1y denote said first comparison-result data, and h2ry, h2rm, h2gy, h2gc, h2bm and h2bc denote said second comparison result data.

4. (currently amended) The color conversion device according to claim 2, wherein

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said coefficient storage means outputs predetermined matrix coefficients Eij (i = 1 to 3, j = 1 to 3), and Fij (i = 1 to 3, j = 1 to 18), and

said third calculation means performs the calculation using the hue data, said ~~said~~ first comparison-result data, said second comparison-result data, said calculation result data, said minimum value α from said ~~calculating~~ <u>first calculation</u> means, and said matrix coefficients to determine said second set of three color data representing cyan, magenta and yellow denoted by Co, Mo and Yo, in accordance with the following formula (2):

$$
\begin{bmatrix} Co \\ Mo \\ Yo \end{bmatrix} = (Eij) \begin{bmatrix} c \\ m \\ y \end{bmatrix} + (Fij) \begin{bmatrix} c*m \\ m*y \\ y*c \\ r*g \\ g*b \\ b*r \\ h1r \\ h1g \\ h1b \\ h1c \\ h1m \\ h1y \\ h2ry \\ h2rm \\ h2gy \\ h2gc \\ h2bm \\ h2bc \end{bmatrix} + \begin{bmatrix} \alpha \\ \alpha \\ \alpha \end{bmatrix} \quad ...(2)
$$

wherein h1r, h1g, h1b, h1c, h1m and h1y denote said first comparison-result data, and h2ry, h2rm, h2gy, h2gc, h2bm and h2bc denote said second comparison result data.

5. (original) The color conversion device according to claim 1, wherein said third calculation means performs said matrix calculation on said hue data, said first comparison-result data, said second comparison-result data, said calculation result data, the coefficients from said coefficient storage means, and said minimum value α from said first calculation means.

6. (currently amended) The color conversion device according to claim 5, wherein

said coefficient storage means outputs predetermined matrix coefficients Eij (i = 1 to 3, j = 1 to 3), and Fij (i = 1 to 3, j = 1 to 19), and

said third calculation means performs the calculation using the hue data, said ~~said~~ first comparison-result data, said second comparison-result data, said calculation result data, said minimum value α from said ~~calculating~~ first calculation means, and said matrix coefficients to determine said second set of three color data representing red, green and blue, denoted by Ro, Go and Bo, in accordance with the following formula (3):

$$\begin{bmatrix} Ro \\ Go \\ Bo \end{bmatrix} = (Eij) \begin{bmatrix} r \\ g \\ b \end{bmatrix} + (Fij) \begin{bmatrix} c*m \\ m*y \\ y*c \\ r*g \\ g*b \\ b*r \\ h1r \\ h1g \\ h1b \\ h1c \\ h1m \\ h1y \\ h2ry \\ h2rm \\ h2gy \\ h2gc \\ h2bm \\ h2bc \\ \alpha \end{bmatrix} \qquad \ldots(3)$$

wherein h1r, h1g, h1b, h1c, h1m and h1y denote said first comparison-result data, and h2ry, h2rm, h2gy, h2gc, h2bm and h2bc denote said second comparison result data.

7. (currently amended) The color conversion device according to claim 5, wherein

said coefficient storage means outputs predetermined matrix coefficients Eij (i = 1 to 3, j = 1 to 3), and Fij (i = 1 to 3, j = 1 to 19), and

said third calculation means performs the calculation using the hue data, said ~~said~~ first comparison-result data, said second comparison-result data, said calculation result data, said minimum value α from said ~~calculating~~ <u>first calculation</u> means, and said

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matrix coefficients to determine said second set of three color data representing cyan, magenta and yellow denoted by Co, Mo and Yo, in accordance with the following formula (4):

$$
\begin{bmatrix} Co \\ Mo \\ Yo \end{bmatrix} = (Eij) \begin{bmatrix} c \\ m \\ y \end{bmatrix} + (Fij) \begin{bmatrix} c*m \\ m*y \\ y*c \\ r*g \\ g*b \\ b*r \\ h1r \\ h1g \\ h1b \\ h1c \\ h1m \\ h1y \\ h2ry \\ h2rm \\ h2gy \\ h2gc \\ h2bm \\ h2bc \\ \alpha \end{bmatrix} \qquad \ldots(4)
$$

wherein h1r, h1g, h1b, h1c, h1m and h1y denote said first comparison-result data, and h2ry, h2rm, h2gy, h2gc, h2bm and h2bc denote said second comparison result data.

8. (original) The color conversion device according to claim 1, wherein

said first set of three color data represent red, green and blue,

said second set of three color data represent red, green and blue, and

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said hue data calculation means calculates the hue data r, g, b, y, m, c by subtraction in accordance with:

$r = Ri - \alpha,$

$g = Gi - \alpha,$

$b = Bi - \alpha,$

$y = \beta - Bi,$

$m = \beta - Gi,$ and

$c = \beta - Ri,$

wherein Ri, Gi and Bi represent said first set of three color data.

9. (currently amended) The color conversion device according to claim 1, wherein

said first set of three color data represent cyan, magenta and yellow,

said second set of three color data represent red, green and blue,

said color conversion device further comprises means for determining a complement of said first set of three color data, and

said hue data calculation means calculates the hue data r, g, b, y, m, c by subtraction in accordance with:

$r = Ri - \alpha,$

$g = Gi - \alpha,$

$b = Bi - \alpha,$

$y = \beta - Bi,$

$m = \beta - Gi,$ and

$$c = \beta - Ri,$$

wherein Ri, Gi and Bi represent data produced by the determination of the complement of said first set of three color data.

10. (original) The color conversion device according to claim 1, wherein

said first set of three color data represent cyan, magenta and yellow,

said second set of three color data represent cyan, magenta and yellow, and

said hue data calculation means calculates the hue data r, g, b, y, m, c by subtraction in accordance with:

$$r = \beta - Ci,$$

$$g = \beta - Mi,$$

$$b = \beta - Yi,$$

$$y = Yi - \alpha,$$

$$m = Mi - \alpha, \text{ and}$$

$$c = Ci - \alpha.$$

wherein Ci, Mi and Yi represent said first set of three color data.

11. (currently amended) The color conversion device according to claim 1, wherein

said first set of three color data represent red, green and blue,

said second set of three color data represent cyan, magenta and yellow,

said <u>color conversion</u> device further comprises means for determining a complement of said first set of three color data, and

said hue data calculation means calculates the hue data r, g, b, y, m, c by subtraction in accordance with:

r = β - Ci,

g = β - Mi,

b = β - Yi,

y = Yi - α,

m = Mi - α, and

c = Ci - α.

wherein Ci, Mi and Yi represent data produced by the determination of the complement of said first set of three color data.

12. (original) The color conversion device according to claim 1, wherein

said first comparison-result data generating means determines the comparison-result data among the hue data r, g and b, and the comparison-result data among the hue data y, m and c, and

said second comparison-result data generating means comprises multiplying means for multiplying the first comparison-result data outputted from said first comparison-result data generating means with specific calculation coefficients, and means for determining the comparison-result data based on the outputs of said multiplication means.

13. (original) The color conversion device according to claim 12, wherein

said first comparison-result data generating means determines the first comparison-result data:

h1r = min (m, y),

h1g = min (y, c),

h1b = min (c, m),

h1c = min (g, b),

h1m = min (b, r), and

h1y = min (r, g),

(with min (A, B) representing the minimum value of A and B),

said second comparison-result data generating means determines the second comparison-result data:

h2ry = min (aq1*h1y, ap1*h1r),

h2rm = min (aq2*h1m, ap2*h1r),

h2gy = min (aq3*h1y, ap3*h1g),

h2gc = min (aq4*h1c, ap4*h1g),

h2bm = min (aq5*h1m, ap5*h1b), and

h2bc = min (aq6*h1c, ap6*h1m).

14. (original) The color conversion device according to claim 12, wherein

said multiplying means in said second comparison-result data generating means performs calculation on said first comparison result-data and said calculation coefficients by setting said calculation coefficients aq1 to aq6 and ap1 to ap6 to integral values of 2^n, with n being an integer, and by bit shifting.

15. (original) The color conversion device according to claim 1, wherein said second calculation means determines products of the hue data.

16. (original) The color conversion device according to claim 1, wherein each of said first comparison-result data is determined from two of the hue data and is effective for only one of the six hues of red, green, blue, cyan, magenta and yellow.

17. (original) The color conversion device according to claim 1, wherein each of said second comparison-result data is determined from two of the first comparison-result data and is effective for only one of the six inter-hue areas of red-yellow, yellow-green, green-cyan, cyan-blue, blue-magenta, and magenta-red.

18. (original) The color conversion device according to claim 1, wherein

said coefficient storage means outputs specified matrix coefficients Eij (i = 1 to 3, j = 1 to 3) based on a formula (5) below:

$$(Eij) \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad \ldots(5)$$

and outputs the matrix coefficients Fij (i = 1 to 3, j = 1 to 18, or j = 1 to 19) such that, of the coefficients Fij, the coefficients for said calculation result data are set to zero, and other coefficients are set to specified values.

19. (original) The color conversion device according to claim 1, wherein

said first calculation means calculates a maximum value ß and a minimum value α using said first set of three color data, and generates an identification code indicating the hue data which is of a value zero, and

said second calculation means performs arithmetic operation on said hue data based on the identification code outputted from said first calculation means,

said coefficient storage means outputs said matrix coefficients based on the identification code outputted from said first calculation means, and

said third calculation means performs matrix calculation using the coefficient from said coefficient storage means to produce said second set of three color data based on the identification code outputted from said first calculation means.

20. (currently amended) A method of manufacturing a color conversion device which is for use with an input or output device and which performs pixel-by-pixel color conversion from a first set of three color data representing red, green and blue, or cyan, magenta and yellow, into a second set of three color data representing red, green and blue, or cyan, magenta, and yellow, said color conversion device comprising:

first calculation means for calculating a minimum value α and a maximum value ß of said first set of three color data for each pixel;

hue data calculating means for calculating hue data r, g, b, y, m and c based on said first set of three color data, and said minimum and maximum values α and ß outputted from said ~~calculating~~ <u>first</u> calculation means;

means for generating first comparison-result data based on the hue data outputted from said hue data calculating means;

means for generating second comparison-result data based on said first comparison-result data;

second calculation means for performing calculation using the hue data outputted from said hue data calculating means to produce calculation result data;

coefficient storage means for ~~storing~~ <u>providing</u> coefficients for the hue data, the calculation result data, the first comparison-result data and the second comparison-result data; and

third calculation means responsive to said hue data, said first comparison-result data, said second comparison-result data, said calculation result data, and the coefficients from said coefficient storage means for calculating said second set of three color data representing red, green and blue, or cyan, magenta, and yellow, said <u>third calculation</u> means performing calculation including matrix calculation performed at least on said hue data, said first comparison-result data, said second comparison-result data, said calculation result data, and the coefficients from said coefficient storage means, said method comprising the steps of:

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(a) producing [[a]] the color conversion device which includes the above-recited elements, but in which said coefficients are not stored in said coefficient storage means; and

(b) writing said coefficients [[in]] to said coefficient storage means ~~taking into consideration the~~ on the basis of characteristics of the input or output device with which the color conversion device is to be used.